

# PATENT ABSTRACTS OF JAPAN

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(54) METHOD FOR TREATING INK JET RECORDED MATTER

(57)Abstract:

PROBLEM TO BE SOLVED: To form a recorded matter stable for a long period even with an image having a high optical density by bringing a medium for forming an image by using multiple printing of a gray level dye ink into contact with a cleaning liquid and treating, and then bringing the medium after the treating into contact with pure water and treating.

SOLUTION: An image is formed on a medium having water resistance by multiple printing of a gray level dye ink by using an ink jet recording method, the medium formed with the ink is brought into contact with a cleaning liquid, and dried. Further, the medium is brought into contact with pure water, then dried, and an ink jet recorded matter is treated. An at least ink receptive layer of the medium having the water resistance suitably contains a pseudo-boehmatite and a binder. In this case, the binder is suitably selected from water soluble polymer binder or the like. The cleaning liquid is suitably selected from pure water, at most 5C alcohols, an organic solvent for the ink and a surfactant solution, and at most 4C alcohols are more suitable.

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**CLAIMS**

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[Claim(s)]

[Claim 1] The ink jet record object art characterized by drying after contacting the medium by which the image was formed in the medium which has a water resisting property using the ink jet record approach multiplex printing of shade color ink, and this image was formed to a penetrant remover.

[Claim 2] The ink jet record object art characterized by contacting the medium by which the image was formed in the medium which has a water resisting property using the ink jet record approach multiplex printing of shade color ink, and this image was formed to a penetrant remover, making pure water contact further, and drying the back.

[Claim 3] The ink jet record object art of the medium which has said water resisting property according to claim 1 or 2 in which an ink absorbing layer contains pseudo-boehmite and a binder at least.

[Claim 4] The ink jet record object art according to claim 3 as which said binder is chosen from water soluble polymer binders.

[Claim 5] The art of the ink jet record object according to claim 1 or 2 said whose penetrant remover is at least one sort chosen from pure water, with a carbon number of five or less alcohols, the organic solvent for ink, or a wetting agent solution.

[Claim 6] The ink jet record object art according to claim 5 said whose penetrant remover is pure water or with a carbon number of four or less alcohol.

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## DETAILED DESCRIPTION

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[Detailed Description of the Invention]

[0001]

[Field of the Invention] This invention relates to the art of an ink jet record object in more detail about the ink jet record which records using ink.

[0002]

[Description of the Prior Art] In recent years, the ink jet recording device recorded using ink as the printer and copying machine of a personal computer is spreading. Since cheap and full color record is possible for an ink jet recording device, the need is still larger. And the demand of faithful reappearance of a gradation image has been increasing as part of high-definition-izing. For example, it is supposed by the monochrome image that it is usually a medical image like an X-ray film or a CAT image the 4096 gradation extent need.

[0003] Generally as the record approach of the gradation image by ink dots, such as an ink jet printer The analog modulation method for changing the path of the ink dot which adheres to the recording paper by changing an electrical potential difference or pulse width impressed to a recording head, The digital modulation method for performing gradation record by changing the number of dots driven in into a dot matrix, without the path of an ink dot changing, The digital-analog modulation method for changing the number of dots and the diameter of a dot in a dot matrix combining an analog modulation method and a digital modulation method etc. is learned.

[0004] However, in the analog modulation to which the path of an ink dot is changed, there are a point that the path of an ink dot is not stabilized, and a trouble that a limitation is in the further recordable magnitude of the minimum dot, and the gradation property is worsened in the result, especially the highlights section (low concentration section). Moreover, in the digital modulation method using a matrix, when it is going to express 256 gradation, for example, the problem that the image of high resolution with which 16x16 matrices are needed with an image, consequently real resolution falls is difficult arises.

[0005] Then, as for the analog modulation to which the path of an ink dot is changed in order to obtain the stable image, it is common to perform binary-ized processing of error diffusion etc. and to output a gradation image in order to avoid the substantial fall of resolution, without using. However, the gradation of 4096 gradation was not able to be taken out at all with such an approach like the medical image mentioned above.

[0006] The ink jet recording device which records a multi-gradation image under such circumstances combining two or more kinds of ink which has different concentration is proposed. It becomes possible by recording such ink in piles as 2 times and 3 times to express more [ far ] gradation than the number of classes of ink.

[0007]

[Problem(s) to be Solved by the Invention] Unlike the output image of a personal computer, an above-mentioned medical image etc. has many parts with high optical density. Then, the concentration of the coloring agent in ink tended to be raised and it is going to make optical density high. However, when a color was used, when concentration was made high, fixing in respect of the orifice of a nozzle became a problem, and there were problems, like viscosity rises and discharge-comes to be hard. Under such a situation, the approach of the color concentration of 0.1 - 5 weight section extent differing, or raising optical density for the ink of the same

concentration in piles has been used. In order to absorb a lot of ink and to obtain a sharp image moreover, what used the silica and the alumina is desirable in the ink absorbing layer used by this approach in respect of the absorptivity of ink, and the homogeneity of the diameter of a dot, and what used pseudo-boehmite especially has been well used for it.

[0008] Thus, since much ink was driven in, when the created image was saved in the state of high-humidity/temperature, the image blot (migration) might take place under the effect of the moisturizer contained in ink.

[0009] The purpose of this invention prevents a blot (migration) of the image obtained using the ink jet recording method, and is to offer the approach that an image stable for a long period of time can be obtained.

[0010]

[Means for Solving the Problem] The above-mentioned purpose is attained by the following invention.

[0011] (1) The ink jet record object art characterized by drying after contacting the medium by which the image was formed in the medium which has a water resisting property using the ink jet record approach multiplex printing of shade color ink, and this image was formed to a penetrant remover.

[0012] (2) The ink jet record object art characterized by contacting the medium by which the image was formed in the medium which has a water resisting property using the ink jet record approach multiplex printing of shade color ink, and this image was formed to a penetrant remover, making pure water contact further, and drying the back.

[0013] (3) It is an ink jet record object art the above (1) of the medium which has said water resisting property in which an ink absorbing layer at least contains pseudo-boehmite and a binder, or given in (2).

[0014] (4) An ink jet record object art given in the above (3) as which said binder is chosen from water soluble polymer binders.

[0015] (5) The art of an ink jet record object the above (1) said whose penetrant remover is at least one sort chosen from pure water, with a carbon number of five or less alcohols, the organic solvent for ink, or a surface active agent solution, or given in (2).

[0016] (6) An ink jet record object art given in the above (5) said whose penetrant remover is pure water or with a carbon number of four or less alcohol.

[0017]

[Embodiment of the Invention] In this invention, the coloring matter used for ink is not limited at all, and the mixture of the well-known color used as a coloring matter from the former or two or more sorts of colors can be used for it. For example, direct dye, acid dye, the food color, reactive dye, a disperse dye, vat dye, solubilized vat dye, a reaction disperse dye, fat dye, a pigment, etc. are mentioned. Although the content in the inside of the ink of these record agent is determined depending on the class of solvent body constituent, the property required of ink, it is suitably made into 0.10 – 5 % of the weight more preferably 0.08 to 10% of the weight 0.05 to 20% of the weight to all ink weight in this invention.

[0018] As an organic solvent used for the ink of this invention For example, methyl alcohol, ethyl alcohol, n-propyl alcohol, Isopropyl alcohol, n-butyl alcohol, sec-butyl alcohol, tert-butyl alcohol, isobutyl alcohol, n-pentanol, Alcohols, such as a cyclohexanol; Amides; acetones, such as dimethylformamide and dimethylacetamide, Ketones or keto alcohol, such as diacetone alcohol; A tetrahydrofuran, Ether, such as dioxane; A diethylene glycol, triethylene glycol, Tetraethylene glycol, dipropylene glycol, tripropylene glycol, Oxyethylene or oxypropylene addition polymers, such as a polyethylene glycol and a polypropylene glycol; Ethylene glycol, Propylene glycol, a trimethylene glycol, a butylene glycol, Alkylene glycol, such as 1, 2, 6-hexane triol, and hexylene glycol; Thiodiglycol, Glycerol; The ethylene glycol monomethyl (or ethyl) ether, The low-grade alkyl ether of polyhydric alcohol, such as the diethylene-glycol monomethyl (or ethyl) ether and the triethylene glycol monomethyl (or ethyl) ether; A sulfolane, A N-methyl-2-pyrrolidone, 1,3-dimethyl-2-imidazolidinone, etc. are mentioned. The content of the above-mentioned organic solvent is 2 – 30% of the weight of the range preferably one to 50% of the weight to the total weight of ink in this invention.

[0019] Although it can be used also as mixture even if the above-mentioned organic solvent is

independent, desirable solvent body composition is the mixture of water and the above-mentioned organic solvent more than a kind. It is a more desirable water solubility [ like polyhydric alcohol, such as a diethylene glycol, triethylene glycol, and a glycerol ] high boiler whose organic solvent of this is, and the above-mentioned organic solvent is the mixture of the water-soluble above-mentioned high boiler and monohydric alcohol especially preferably.

[0020] Especially content of the water-soluble above-mentioned high boiler is desirable in respect of the dependability of recording heads, such as improvement in blinding prevention of a nozzle, and the regurgitation property of ink, in the recording method of a certain kind in ink jet record. Moreover, the ink which the color used by this invention contains can add a surfactant, a defoaming agent, antiseptics, etc. suitably other than the above-mentioned component if needed, in order to give a desired physical-properties value.

[0021] As a surfactant added in ink, nonionic surfactants, such as anionic surfactants, such as fatty-acid salts, higher-alcohol sulfate salts, liquid fatty-oil sulfate salts, and alkyl allyl compound sulfonates, polyoxyethylene alkyl ether, polyoxyethylene alkyl ester, polyoxyethylene sorbitan alkyl ester, acetylene alcohol, and an acetylene glycol, are mentioned, and these one sort or two sorts or more can be used, choosing them suitably. As for the amount used, it is desirable to consider as about 0.01 – 5 % of the weight to the ink whole quantity. Moreover, it is desirable in this case to determine the addition of a surfactant that the surface tension of ink will become 30 or more dyne/cm. That is, it is because the situations which are not desirable, such as a printing kink (gap of the impact area of an ink droplet) at the tip of a nozzle depended for getting wet, will be caused in record by the ink jet recording method used by this invention if a value with the surface tension of ink smaller than this is shown.

[0022] As an ink absorbing layer of the medium which has a water resisting property, the thing to which inorganic porosity, such as a silica, a calcium carbonate, a magnesium carbonate, a titania, a white zinc compound, a zeolite, a vermiculite, the diatom earth, a kaolinite, and an alumina, was made to bind with giant-molecule binders, such as conjugated diene system polymer latexes, such as polyvinyl alcohol and an SBR latex, an acrylic polymer latex, a vinyl system polymer latex, starch, casein, soybean protein, and gelatin, is used suitably. Especially the thing using a silica or an alumina is desirable in respect of the absorptivity of ink, and the homogeneity of the diameter of a dot, and what used pseudo-boehmite especially is good.

[0023] The hydrated alumina which has the boehmite structure of the medium which has the water resisting property used in this invention which exists all over an ink absorbing layer at least is defined by the following general formula.

[0024] aluminum — the inside of a  $2O_3-n(OH)_2 \cdot n \cdot mH_2O$  type, and  $n$  — either of the integers of 0, 1, 2, or 3 — expressing —  $m$  — 0–10 — the value of 0–5 is expressed preferably. Since  $mH_2O$  is a thing showing the aqueous phase which does not participate in formation of a crystal lattice in many cases and which can be \*\*\*\*\*ed,  $m$  can take the value which is not an integer. Moreover, when this kind of ingredient is calcined, it is possible that  $m$  reaches the value of 0. Especially as the manufacture approach of the hydrated alumina which has the boehmite structure of the medium which has the water resisting property used in this invention contained in an ink absorbing layer at least, although not limited, any approaches, such as the approach of manufacturing hydrated alumina, for example, a Bayer process, and an alum thermal decomposition method, are employable preferably. The approach of adding an acid and hydrolyzing to a long-chain aluminum alkoxide, is mentioned especially preferably. Carbon numbers are five or more alkoxides, and when especially the alkoxide of carbon numbers 12–22 is used, since removal of an alcohol content which is mentioned later, and configuration control of the hydrated alumina which has boehmite structure become easy, a long-chain aluminum alkoxide is desirable.

[0025] As compared with the approach of manufacturing an alumina hydrogel and a cationic alumina, there is an advantage of being hard to mix impurities, such as various ion, in the above-mentioned approach. Furthermore, in order that the alcohol after hydrolysis may tend to remove a long-chain aluminum alkoxide, it has the advantage that dealcoholization-ization can be performed completely, compared with the case where short chain alkoxides, such as aluminum isopropoxide, are used.

[0026] The hydrated alumina which has the boehmite structure acquired by the above-mentioned approach creates hydrated alumina dispersion liquid by growing up a particle through the process

of hydrothermal synthesis (aging process). Hydrated alumina powder is created by drying the obtained dispersion liquid.

[0027] The hydrated alumina which has boehmite structure is fixable with an X-ray diffraction method, the hydrated alumina which has the boehmite structure contained in the recorded media which can be used for this invention — "catalyst — formation — an X-ray diffraction pattern similar to Bohmit shown in technical report" Vol.2, No.2, p11 (1984), and the Fig.7 upper right is given.

[0028] The formation approach of the ink absorbing layer of a medium of having a water resisting property can use the approach of using a coater, and applying and drying the distributed solution which consists of hydrated alumina which has boehmite structure, and a binder on a base material.

[0029] The binder used by this invention can be chosen freely out of a water soluble polymer compound, and can be used, for example, polyvinyl alcohol or its denaturation object (anion denaturation cation denaturation —) Silanol denaturation, starch or its denaturation object (oxidization, etherification), gelatin, or its denaturation object, Casein or its denaturation object, a carboxymethyl cellulose, gum arabic, Cellulosics, such as hydroxyethyl cellulose and hydroxypropyl methylcellulose, Conjugated diene system copolymer latexes, such as an SBR latex, an NBR latex, and a methyl methacrylate-butadiene copolymer, Vinyl system copolymer latexes, such as a functional-group denaturation polymer latex and an ethylene-vinyl acetate copolymer, a polyvinyl pyrrolidone, a maleic anhydride or its copolymer, an acrylic ester copolymer, etc. are desirable. The mixing ratio of the hydrated alumina which has boehmite structure, and a binder can be chosen from between 1:5-25:1 as arbitration. When there are few amounts of a binder than the above-mentioned range, the mechanical strength of an ink absorbing layer is insufficient, a crack and powder omission occur, when [ than the above-mentioned range ] more, pore volume decreases and absorption of ink worsens. It is also possible to add a pigment agent, a thickener, pH regulator, lubricant, a fluid modifier, a surfactant, a defoaming agent, a deck-watertight-luminaire-ized agent, foam suppressor, a release agent, a foaming agent, a penetrating agent, a coloring color, a fluorescent brightener, an ultraviolet ray absorbent, an anti-oxidant, antiseptics, and a \*\* motorcycle agent if needed to a pigment and a binder.

[0030] It can choose freely [ out of well-known compounds, such as halogenation quarternary ammonium salt, a quarternary-ammonium-salt polymer, and a chitosan compound, ] as a deck-watertight-luminaire-ized agent, it can combine, and can use.

[0031] The sheet-like matter and textile like papers, such as paper which performed sizing moderate as a base material of the medium which has a water resisting property, non-size paper, and resin coat paper, and a thermoplastic film can be used. In the case of a thermoplastic film, bright films, such as polyester, polystyrene, a polyvinyl chloride, polymethylmethacrylate, cellulose acetate, polyethylene, and a polycarbonate, and the sheet by restoration or detailed foaming of a pigment which opacified can also be used. As a protective layer prepared in the opposite side of the ink absorbing layer of a base material, thermoplastics, such as polyethylene, a polyvinyl chloride, polyvinyl acetate, and a polyvinyl butyral, is applied, in the particle emulsion of what was made into the shape of a film, or said resin, it applies with a binder and independent or the dried thing is used.

[0032] The approach of forming an image in the medium which has a water resisting property by multiplex printing of shade color ink can be enforced by the well-known approach.

[0033] The waterproof medium by which the image was formed is contacted to a penetrant remover. Although what kind of means by which media, such as immersion of a medium, and penetrant remover to the inside of a penetrant remover contact as a means for contact may be used, the above-mentioned immersion is desirable.

[0034] As the above-mentioned penetrant remover, independent or two sorts or more can be mixed, and the organic solvent and surfactant which are used for pure water (ion exchange water is also included), with a carbon number of five or less alcohols (for example, a methanol, ethanol, n-propanol, isopropanol, n-butanol, a sec-butanol, a tert-butanol, n-pentanol), and ink can be used. Especially, pure water (ion exchange water is also included) or with a carbon number of four or less alcohols is used preferably.

[0035] The processing time (contact time with a penetrant remover) has not much little

effectiveness in a short time, and is the futility of time amount in long duration not much. The processing time follows, is desirable 2 seconds or more, and is desirable especially 5 seconds or more. [ of 30 or less minutes ] [ of 1 or less hour ]

[0036] When processing by immersion into the penetrant remover of a medium, a penetrant remover is made to rock, or a supersonic wave may be irradiated and a penetrant remover may be vibrated.

[0037] By the air jet, eradication, etc., the medium contacted to the penetrant remover is dried, after removing waterdrop. Desiccation is 30–100 degrees C preferably, and can be performed in oven etc.

[0038] When an organic solvent is used as a penetrant remover, the medium contacted to the organic solvent as mentioned above can be further contacted for 3 – 60 seconds as preferably as pure water, and can be dried the back.

[0039]

[Example] Hereafter, based on an example, this invention is explained concretely.

Example 1 black ink BK1–5: C. I. hood black 2 0. 25, 0.5, 1 and 2, the four sections A polyethylene glycol (#100) The ten sections A glycerol The ten sections Isopropyl alcohol The four sections Water The 100 sections of ink of five kinds of color concentration of the remainder were prepared, respectively.

[0040] The transparence record medium containing pseudo-boehmite was prepared by the approach shown in JP,09–066664,A. The thickness of the ink absorbing layer at this time was adjusted so that it might be set to 40 micrometers, and it was cut in A4 size. The five above–mentioned kinds of ink was used for this medium, and monochrome shade image was recorded on it. One of sheets of this was promptly taken out, after being immersed in ion exchange water for 5 seconds, and surface waterdrop was sucked up by BEMCOT (trade name: product made from ASAHI CHEMICAL). Then, after drying for 30 minutes in 60–degree C oven, when OD (optical density) was measured, there were not a processing front and change.

[0041] When it took out after saving this sample for seven days in 40 degrees C and the environment of 80%RH, and OD was measured, the rate of change of OD was 2% or less.

[0042] On the other hand, OD rate of change of an unsettled sample was just over or below 5%. The same record object sample as example 2 example 1 was prepared, the processing time in ion exchange water was changed with 30 seconds, 10 minutes, 30 minutes, and 1 hour, and it experimented like the example 1.

[0043] In processing–time 30 seconds, it was 1% or less, and in 10 minutes, OD change after 40 degrees C and 80%RH preservation was 0.5% or less in 0.6% or less and 30 minutes, and was the same result as 30 minutes at 0.5% or less in 1 hour.

The same record object sample as example 3 example 1 was prepared, and it experimented by changing the processing time in the 1:1 mixing penetrant remover of ion exchange water and isopropyl alcohol with 2 seconds, 10 seconds, 1 minute, 30 minutes, and 1 hour, and further, after that, it was immersed in distilled water for about 10 seconds, and processed.

[0044] OD change after 40 degrees C and 80%RH preservation was 0.4% or less of rate of change in 0.8% or less and 10 minutes in processing–time 2 seconds in 0.5% or less, 30 minutes, and 1 hour in 1.5% or less of rate of change, and 10 seconds.

[0045] Moreover, when the alphabetic character part of these samples was observed with the microphotography, there were not a processing front and change.

[0046] Furthermore, change was not observed although it took out after saving these samples for seven days in 40 degrees C and the environment of 80%RH, and observed with the microphotography. On the other hand, when the unsettled record object sample saved in the above–mentioned environment at coincidence was observed with the microphotography, the blot had arisen in the boundary part of a line.

[0047]

[Effect of the Invention] According to this invention, the image with high optical density also became possible [ offering the record object stabilized for a long period of time ] by contacting the medium which formed the image using multiplex printing of shade color ink to a penetrant remover, and processing it.

[0048] Moreover, after processing a medium as mentioned above, the image with high optical

density also became possible [ offering the record object stabilized more for a long period of time ]  
by making pure water contact further.

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**TECHNICAL FIELD**

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[Field of the Invention] This invention relates to the art of an ink jet record object in more detail about the ink jet record which records using ink.

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**PRIOR ART**

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[Description of the Prior Art] In recent years, the ink jet recording device recorded using ink as the printer and copying machine of a personal computer is spreading. Since cheap and full color record is possible for an ink jet recording device, the need is still larger. And the demand of faithful reappearance of a gradation image has been increasing as part of high-definition-izing. For example, it is supposed by the monochrome image that it is usually a medical image like an X-ray film or a CAT image the 4096 gradation extent need.

[0003] Generally as the record approach of the gradation image by ink dots, such as an ink jet printer The analog modulation method for changing the path of the ink dot which adheres to the recording paper by changing an electrical potential difference or pulse width impressed to a recording head, The digital modulation method for performing gradation record by changing the number of dots driven in into a dot matrix, without the path of an ink dot changing, The digital-analog modulation method for changing the number of dots and the diameter of a dot in a dot matrix combining an analog modulation method and a digital modulation method etc. is learned.

[0004] However, in the analog modulation to which the path of an ink dot is changed, there are a point that the path of an ink dot is not stabilized, and a trouble that a limitation is in the further recordable magnitude of the minimum dot, and the gradation property is worsened in the result, especially the highlights section (low concentration section). Moreover, in the digital modulation method using a matrix, when it is going to express 256 gradation, for example, the problem that the image of high resolution with which 16x16 matrices are needed with an image, consequently real resolution falls is difficult arises.

[0005] Then, as for the analog modulation to which the path of an ink dot is changed in order to obtain the stable image, it is common to perform binary-ized processing of error diffusion etc. and to output a gradation image in order to avoid the substantial fall of resolution, without using. However, the gradation of 4096 gradation was not able to be taken out at all with such an approach like the medical image mentioned above.

[0006] The ink jet recording device which records a multi-gradation image under such circumstances combining two or more kinds of ink which has different concentration is proposed. It becomes possible by recording such ink in piles as 2 times and 3 times to express more [ far ] gradation than the number of classes of ink.

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**EFFECT OF THE INVENTION**

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[Effect of the Invention] According to this invention, the image with high optical density also became possible [ offering the record object stabilized for a long period of time ] by contacting the medium which formed the image using multiplex printing of shade color ink to a penetrant remover, and processing it.

[0048] Moreover, after processing a medium as mentioned above, the image with high optical density also became possible [ offering the record object stabilized more for a long period of time ] by making pure water contact further.

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**TECHNICAL PROBLEM**

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[Problem(s) to be Solved by the Invention] Unlike the output image of a personal computer, an above-mentioned medical image etc. has many parts with high optical density. Then, the concentration of the coloring agent in ink tended to be raised and it is going to make optical density high. However, when a color was used, when concentration was made high, fixing in respect of the orifice of a nozzle became a problem, and there were problems, like viscosity rises and discharge-comes to be hard. Under such a situation, the approach of the color concentration of 0.1 - 5 weight section extent differing, or raising optical density for the ink of the same concentration in piles has been used. In order to absorb a lot of ink and to obtain a sharp image moreover, what used the silica and the alumina is desirable in the ink absorbing layer used by this approach in respect of the absorptivity of ink, and the homogeneity of the diameter of a dot, and what used pseudo-boehmite especially has been well used for it.

[0008] Thus, since much ink was driven in, when the created image was saved in the state of high-humidity/temperature, the image blot (migration) might take place under the effect of the moisturizer contained in ink.

[0009] The purpose of this invention prevents a blot (migration) of the image obtained using the ink jet recording method, and is to offer the approach that an image stable for a long period of time can be obtained.

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**MEANS**

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[Means for Solving the Problem] The above-mentioned purpose is attained by the following invention.

[0011] (1) The ink jet record object art characterized by drying after contacting the medium by which the image was formed in the medium which has a water resisting property using the ink jet record approach multiplex printing of shade color ink, and this image was formed to a penetrant remover.

[0012] (2) The ink jet record object art characterized by contacting the medium by which the image was formed in the medium which has a water resisting property using the ink jet record approach multiplex printing of shade color ink, and this image was formed to a penetrant remover, making pure water contact further, and drying the back.

[0013] (3) It is an ink jet record object art the above (1) of the medium which has said water resisting property in which an ink absorbing layer at least contains pseudo-boehmite and a binder, or given in (2).

[0014] (4) An ink jet record object art given in the above (3) as which said binder is chosen from water soluble polymer binders.

[0015] (5) The art of an ink jet record object the above (1) said whose penetrant remover is at least one sort chosen from pure water, with a carbon number of five or less alcohols, the organic solvent for ink, or a surface active agent solution, or given in (2).

[0016] (6) An ink jet record object art given in the above (5) said whose penetrant remover is pure water or with a carbon number of four or less alcohol.

[0017]

[Embodiment of the Invention] In this invention, the coloring matter used for ink is not limited at all, and the mixture of the well-known color used as a coloring matter from the former or two or more sorts of colors can be used for it. For example, direct dye, acid dye, the food color, reactive dye, a disperse dye, vat dye, solubilized vat dye, a reaction disperse dye, fat dye, a pigment, etc. are mentioned. Although the content in the inside of the ink of these record agent is determined depending on the class of solvent body constituent, the property required of ink, it is suitably made into 0.10 – 5 % of the weight more preferably 0.08 to 10% of the weight 0.05 to 20% of the weight to all ink weight in this invention.

[0018] As an organic solvent used for the ink of this invention For example, methyl alcohol, ethyl alcohol, n-propyl alcohol, Isopropyl alcohol, n-butyl alcohol, sec-butyl alcohol, tert-butyl alcohol, isobutyl alcohol, n-pentanol, Alcohols, such as a cyclohexanol; Amides; acetones, such as dimethylformamide and dimethylacetamide, Ketones or keto alcohol, such as diacetone alcohol; A tetrahydrofuran, Ether, such as dioxane; A diethylene glycol, triethylene glycol, Tetraethylene glycol, dipropylene glycol, tripropylene glycol, Oxyethylene or oxypropylene addition polymers, such as a polyethylene glycol and a polypropylene glycol; Ethylene glycol, Propylene glycol, a trimethylene glycol, a butylene glycol, Alkylene glycol, such as 1, 2, 6-hexane triol, and hexylene glycol; Thiodiglycol, Glycerol; The ethylene glycol monomethyl (or ethyl) ether, The low-grade alkyl ether of polyhydric alcohol, such as the diethylene-glycol monomethyl (or ethyl) ether and the triethylene glycol monomethyl (or ethyl) ether; A sulfolane, A N-methyl-2-pyrrolidone, 1,3-dimethyl-2-imidazolidinone, etc. are mentioned. The content of the above-mentioned organic solvent is 2 – 30% of the weight of the range preferably one to 50% of the weight to the total

weight of ink in this invention.

[0019] Although it can be used also as mixture even if the above-mentioned organic solvent is independent, desirable solvent body composition is the mixture of water and the above-mentioned organic solvent more than a kind. It is a more desirable water solubility [ like polyhydric alcohol, such as a diethylene glycol, triethylene glycol, and a glycerol ] high boiler whose organic solvent of this is, and the above-mentioned organic solvent is the mixture of the water-soluble above-mentioned high boiler and monohydric alcohol especially preferably.

[0020] Especially content of the water-soluble above-mentioned high boiler is desirable in respect of the dependability of recording heads, such as improvement in blinding prevention of a nozzle, and the regurgitation property of ink, in the recording method of a certain kind in ink jet record. Moreover, the ink which the color used by this invention contains can add a surfactant, a defoaming agent, antiseptics, etc. suitably other than the above-mentioned component if needed, in order to give a desired physical-properties value.

[0021] As a surfactant added in ink, nonionic surfactants, such as anionic surfactants, such as fatty-acid salts, higher-alcohol sulfate salts, liquid fatty-oil sulfate salts, and alkyl allyl compound sulfonates, polyoxyethylene alkyl ether, polyoxyethylene alkyl ester, polyoxyethylene sorbitan alkyl ester, acetylene alcohol, and an acetylene glycol, are mentioned, and these one sort or two sorts or more can be used, choosing them suitably. As for the amount used, it is desirable to consider as about 0.01 – 5 % of the weight to the ink whole quantity. Moreover, it is desirable in this case to determine the addition of a surfactant that the surface tension of ink will become 30 or more dyne/cm. That is, it is because the situations which are not desirable, such as a printing kink (gap of the impact area of an ink droplet) at the tip of a nozzle depended for getting wet, will be caused in record by the ink jet recording method used by this invention if a value with the surface tension of ink smaller than this is shown.

[0022] As an ink absorbing layer of the medium which has a water resisting property, the thing to which inorganic porosity, such as a silica, a calcium carbonate, a magnesium carbonate, a titania, a white zinc compound, a zeolite, a vermiculite, the diatom earth, a kaolinite, and an alumina, was made to bind with giant-molecule binders, such as conjugated diene system polymer latexes, such as polyvinyl alcohol and an SBR latex, an acrylic polymer latex, a vinyl system polymer latex, starch, casein, soybean protein, and gelatin, is used suitably. Especially the thing using a silica or an alumina is desirable in respect of the absorptivity of ink, and the homogeneity of the diameter of a dot, and what used pseudo-boehmite especially is good.

[0023] The hydrated alumina which has the boehmite structure of the medium which has the water resisting property used in this invention which exists all over an ink absorbing layer at least is defined by the following general formula.

[0024] aluminum — the inside of a  $2O_3 \cdot n(OH)_2 \cdot mH_2O$  type, and  $n$  — either of the integers of 0, 1, 2, or 3 — expressing —  $m$  — 0–10 — the value of 0–5 is expressed preferably. Since  $mH_2O$  is a thing showing the aqueous phase which does not participate in formation of a crystal lattice in many cases and which can be \*\*\*\*\*ed,  $m$  can take the value which is not an integer. Moreover, when this kind of ingredient is calcined, it is possible that  $m$  reaches the value of 0. Especially as the manufacture approach of the hydrated alumina which has the boehmite structure of the medium which has the water resisting property used in this invention contained in an ink absorbing layer at least, although not limited, any approaches, such as the approach of manufacturing hydrated alumina, for example, a Bayer process, and an alum thermal decomposition method, are employable preferably. The approach of adding an acid and hydrolyzing to a long-chain aluminum alkoxide, is mentioned especially preferably. Carbon numbers are five or more alkoxides, and when especially the alkoxide of carbon numbers 12–22 is used, since removal of an alcohol content which is mentioned later, and configuration control of the hydrated alumina which has boehmite structure become easy, a long-chain aluminum alkoxide is desirable.

[0025] As compared with the approach of manufacturing an alumina hydrogel and a cationic alumina, there is an advantage of being hard to mix impurities, such as various ion, in the above-mentioned approach. Furthermore, in order that the alcohol after hydrolysis may tend to remove a long-chain aluminum alkoxide, it has the advantage that dealcoholization-ization can be performed completely, compared with the case where short chain alkoxides, such as aluminum isopropoxide, are used.

[0026] The hydrated alumina which has the boehmite structure acquired by the above-mentioned approach creates hydrated alumina dispersion liquid by growing up a particle through the process of hydrothermal synthesis (aging process). Hydrated alumina powder is created by drying the obtained dispersion liquid.

[0027] The hydrated alumina which has boehmite structure is fixable with an X-ray diffraction method. the hydrated alumina which has the boehmite structure contained in the recorded media which can be used for this invention — "catalyst — formation — an X-ray diffraction pattern similar to Bohmit shown in technical report" Vol.2, No.2, p11 (1984), and the Fig.7 upper right is given.

[0028] The formation approach of the ink absorbing layer of a medium of having a water resisting property can use the approach of using a coater, and applying and drying the distributed solution which consists of hydrated alumina which has boehmite structure, and a binder on a base material.

[0029] The binder used by this invention can be chosen freely out of a water soluble polymer compound, and can be used. for example, polyvinyl alcohol or its denaturation object (anion denaturation cation denaturation —) Silanol denaturation, starch or its denaturation object (oxidization, etherification), gelatin, or its denaturation object, Casein or its denaturation object, a carboxymethyl cellulose, gum arabic, Cellulosics, such as hydroxyethyl cellulose and hydroxypropyl methylcellulose, Conjugated diene system copolymer latexes, such as an SBR latex, an NBR latex, and a methyl methacrylate-butadiene copolymer, Vinyl system copolymer latexes, such as a functional-group denaturation polymer latex and an ethylene-vinyl acetate copolymer, a polyvinyl pyrrolidone, a maleic anhydride or its copolymer, an acrylic ester copolymer, etc. are desirable. The mixing ratio of the hydrated alumina which has boehmite structure, and a binder can be chosen from between 1:5-25:1 as arbitration. When there are few amounts of a binder than the above-mentioned range, the mechanical strength of an ink absorbing layer is insufficient, a crack and powder omission occur, when [ than the above-mentioned range ] more, pore volume decreases and absorption of ink worsens. It is also possible to add a pigment agent, a thickener, pH regulator, lubricant, a fluid modifier, a surfactant, a defoaming agent, a deck-watertight-luminaire-ized agent, foam suppressor, a release agent, a foaming agent, a penetrating agent, a coloring color, a fluorescent brightener, an ultraviolet ray absorbent, an anti-oxidant, antiseptics, and a \*\* motorcycle agent if needed to a pigment and a binder.

[0030] It can choose freely [ out of well-known compounds, such as halogenation quarternary ammonium salt, a quarternary-ammonium-salt polymer, and a chitosan compound, ] as a deck-watertight-luminaire-ized agent, it can combine, and can use.

[0031] The sheet-like matter and textile like papers, such as paper which performed sizing moderate as a base material of the medium which has a water resisting property, non-size paper, and resin coat paper, and a thermoplastic film can be used. In the case of a thermoplastic film, bright films, such as polyester, polystyrene, a polyvinyl chloride, polymethylmethacrylate, cellulose acetate, polyethylene, and a polycarbonate, and the sheet by restoration or detailed foaming of a pigment which opacified can also be used. As a protective layer prepared in the opposite side of the ink absorbing layer of a base material, thermoplastics, such as polyethylene, a polyvinyl chloride, polyvinyl acetate, and a polyvinyl butyral, is applied, in the particle emulsion of what was made into the shape of a film, or said resin, it applies with a binder and independent or the dried thing is used.

[0032] The approach of forming an image in the medium which has a water resisting property by multiplex printing of shade color ink can be enforced by the well-known approach.

[0033] The waterproof medium by which the image was formed is contacted to a penetrant remover. Although what kind of means by which media, such as immersion of a medium, and penetrant remover to the inside of a penetrant remover contact as a means for contact may be used, the above-mentioned immersion is desirable.

[0034] As the above-mentioned penetrant remover, independent or two sorts or more can be mixed, and the organic solvent and surfactant which are used for pure water (ion exchange water is also included), with a carbon number of five or less alcohols (for example, a methanol, ethanol, n-propanol, isopropanol, n-butanol, a sec-butanol, a tert-butanol, n-pentanol), and ink can be used. Especially, pure water (ion exchange water is also included) or with a carbon number of four

or less alcohols is used preferably.

[0035] The processing time (contact time with a penetrant remover) has not much little effectiveness in a short time, and is the futility of time amount in long duration not much. The processing time follows, is desirable 2 seconds or more, and is desirable especially 5 seconds or more. [ of 30 or less minutes ] [ of 1 or less hour ]

[0036] When processing by immersion into the penetrant remover of a medium, a penetrant remover is made to rock, or a supersonic wave may be irradiated and a penetrant remover may be vibrated.

[0037] By the air jet, eradication, etc., the medium contacted to the penetrant remover is dried, after removing waterdrop. Desiccation is 30–100 degrees C preferably, and can be performed in oven etc.

[0038] When an organic solvent is used as a penetrant remover, the medium contacted to the organic solvent as mentioned above can be further contacted for 3 – 60 seconds as preferably as pure water, and can be dried the back.

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[Translation done.]